Dicrotophos- Attachment to the Overview
Summary of the Risk Assessments

Use Profile/Background Information

Table 1. Formulations of Dicrotophos

Formulation	Percent Active Ingredient
Liquid	82%

Table 2. Alternative Active Ingredients (AI) to Dicrotophos

Use Site	Pest	Potential Alternative Active Ingredients (Registered)	Any Pending Alternatives?
Cotton	Aphids, thrips, spider mites, cotton, stinkbugs, fleahoppers, plantbugs, grasshoppers, saltmarsh caterpillars, boll weevils, black fleahoppers and leaf perforators	OP [acephate, chlorpyrifos, profenofos] aldicarb, bifenthrin, imidacloprid, methomyl, pyrethroids, methyl parathion, oxamyl, acephate, dimethoate, dicrotophos, disulfoton, azinphosmetyl,	yes

Table 3. Studies That May Further Refine the Dicrotophos Risk Assessments

Guideline No.	Study	Requested by EPA (y/n; method)	Due Date	Submitted	Rationale
870.6300	**Development Neurotoxicity**	Yes		No	DCI issued in order to evaluate the neurotoxicity of dicrotophos.
830.1550	**Product Identity & Composition**	Yes	6/00	No	A data Guideline that is unfulfilled or deficient.
830.1700	**Preliminary Analysis**	Yes	6/00	No	A data Guideline that is unfulfilled or deficient.
830.1750	**Certified Limits**	Yes	6/00	No	A data Guideline that is unfulfilled or deficient.
830.1800	**Enforcement Analytical**	Yes	6/00	No	A data Guideline that is unfulfilled or deficient.
830.6313	**Stability to Metal and Metal Ions**	Yes	6/00	No	A data Guideline that is unfulfilled or deficient.
830.6316	**Explodability**	Yes	6/00	No	A data Guideline that is unfulfilled or deficient.
830.7050	**UV/Visible Absorption**	Yes	6/00	No	A data Guideline that is unfulfilled or deficient.
830.7100	**Viscosity**	Yes	6/00	No	A data Guideline that is unfulfilled or deficient.

Table 3. (Continued) Studies That May Further Refine the Dicrotophos Risk Assessments

Guideline No.	Study	Requested by EPA (y/n; method)	Due Date	Submitted	Rationale
860.1200	**Direction For Use**	Yes	6/00	No	A data Guideline that is unfulfilled or deficient.
860.1340	**Residue Analytical Methods**	Yes	6/00	No	A data Guideline that is unfulfilled or deficient.

Table 4. Acute and Chronic Dietary Risk from Dicrotophos

Population Subgroup	% aPAD[1] Consumed	% cPAD[2] Consumed
Risk from dicrotophos residues resulting from the application of dicrotophos		
General U.S. Population	4	4
Children 1 to 6 years	9	9.2

1 **Acute Population Adjusted Dose - aPAD**

NOAEL:
UF: 1000
FQPA SF: 10
aRfd: 0.0005 mg/kg/day
aPAD: 0.00005 mg/kg/day
Endpoint: Brain and RBC ChE inhibition
Study: Acute neurotoxicity study in rats

2 **Chronic Population Adjusted Dose - cPAD**

NOAEL: Not established
UF: 1000
FQPA SF: 10
Rfd: 0.00002 mg/kg/day
cPAD: 0.000002 mg/kg/day
Endpoint: Brain and RBC ChE inhibition
Study: Chronic toxicity study in rats

Table 5. Risk Drivers/Contribution to Exposure

Commodity	Risk Contribution	If "Yes," Quantitative Explanation; If "No," Qualitative Explanation
Cotton (oil)	No	Insignificant contribution

Drinking Water Exposure/Risk Assessment

Table 6. Level of Refinement

	Tier I GENEEC	Tier I SCI-GROW	Tier II PRZM/ EXAMS	Monitoring Data Available?	Tier III Monitoring Data Used
Surface Water			x	Yes	No
Ground Water		x		Yes	No

Table 7. Input Parameters Used for Calculating the Surface Water EECs

Parameter	Value	Source/Rationale
Crop Modeled	Cotton	Known number of applications and is the only use
Number of Applications	3 per year	Maximum labeled number of applications
Application Rate	0.5 lb ai/A	Maximum label rate
Application Method	Aerial and ground-boom	The rates are 1% of the applied spray volume from ground applications and 5% form aerial.
Soil Half-Life	2.7	Laboratory soil metabolism studies showed that dicrotophos degraded rapidly under aerobic and anaerobic conditions.
Soil K_{oc}	11,53,40 and 187	Adsorption/desorption studies showed that dicrotophos was mobile in sandy loam, silt loam and clay soils.
Hydrolysis	28 days	at pH 9, 7 and 5 respectively
Aerobic Aquatic Metabolism	Persistent	Soil mobility studies submitted by the registrant.

Occupational Exposure/Risk Assessment

Table 8. Endpoints for Assessing Occupational Risks from the Use of Dicrotophos

Test	Study	NOAEL	LOAEL	Endpoint
Short-term Dermal	Acute Neurotoxicity-Rat	Not established	0.5 mg/kg/day	RBC and Brain ChE on day 1.
Intermediate-term Dermal	Subchronic Neurotoxicity- Rat	Not established	0.04mg/kg/day	RBC and Brain ChE in both sexes.
Inhalation (short & intermediate)	Subchronic Neurotoxicity- Rat	Not established	0.5mg/kg/day	RBC and Brain ChE.

Table 9. Occupational Risk from Dicrotophos

Scenarios	Acres Treated per Application	Application Rate (lbs ai/acre)	Combined Dermal and Inhalation Margins of Exposure (MOE)		
			Baseline*	PPE*	Engineering Controls
Mixer/Loader Exposure					
(1a) Mixing/loading of liquid formulation for aerial application and chemigation	1200	0.5			150
(1b) Mixing/loading of liquid formulation for ground boom application	80	0.5			640
Applicator Exposure					
(2) Applying sprays with a fixed-wing aircraft	1200	0.5			71
(3) Applying sprays with groundboom equipment	80	0.5			1100
FLAGGER Exposure					
(4) Flagging aerial spray applications	1200	0.5			74

*** The occupational risk assessments are LOAEL less than 1mg/kg and the margin of exposure is required to be 1000 or greater, only engineering control risk mitigation is assessed for dicrotophos.**

Table 10. Chronological List of Incidents from the OPP Incident Data System

Date	Misuse? (yes/no/unknown)	Incident Description	Resulting Label Changes
	Unknown	There are a total of 64 dicrotophos cases in the Poison Control Center data base. Of these, 32 cases were occupational exposure; 30 (94%) involved exposure to dicrotophos alone and 2 (6%) involved exposure to multiple chemicals, including dicrotophos.	Unknown
	Unknown	There were a total of 19 adult non-occupational exposures; 15 (79%) involved this chemical alone and 4 (21%) were attributed to multiple chemicals. In this case workers who were indirectly exposes (not handlers) were classified as non-occupational cases. Compared to other organophosphate insecticides, dicrotophos was above the median for percent occupational cases seen in a health care facility, but below the median for percent cases with symptoms. Too few non-occupational cases were reported to provide reliable indicators.	Unknown
1985-1992.	Unknown	A separate analysis was conducted for exposure in children five years of age and under from For dicrotophos, there were 13 incidents; 13 involved exposure to dicrotophos alone and none involved other pesticides as well. This number of cases was too few to warrant comparisons with other organophosphate and carbamates.	Unknown

Ecological Effects Exposure/Risk Assessment

Terrestrial Exposure Assessment

Table 11. Estimated Environmental Concentrations (EECs) on Avian and Mammalian Food Items Following a Single Application at 1 lb ai/A

Food Items	Maximum EEC (ppm)	Mean EEC (ppm)
Short Grass	120	18
Tall Grass	55	8.1
Broadleaf/Forage Plants and Small Insects	68	10
Fruits, Pods, Seeds, and Large Insects	7.5	1.1

Table 12. Selection of Toxicological Endpoints Used to Determine Risk Quotients (RQs)

Type of Toxicity	Organism	Species	Toxicological Endpoint (ppm or mg/kg)
Oral acute	Bird	California Quail	LD_{50}=1.89 mg/kg
Dietary		Japanese Quail	LD=32ppm
Chronic		Northern Bob White	NOAEL=0.50ppm
Acute	Mammal	Rat	LD_{50} =9.0 mg/kg
Chronic		Rat	NOAEL=2ppm
Acute	Freshwater Fish	Rainbow Trout	LC_{50} =6.3ppm
Chronic		N/A	N/A
Acute	Freshwater Invertebrate	Water Flea	EC_{50} =12.7ppb
Chronic		Water Flea	NOAEL
Acute	Estuarine Fish	Sheephead Minnow	LC_{50} =83.8ppm
Chronic		N/A	N/A
Acute	Estuarine Invertebrate	Mysid	EC_{50} =0.077ppm
Chronic		Mysid	NOAEL=3.09ppb

Table. 13 Comparison of Acute and Chronic Risk Quotients (RQs) to Levels of Concern (LOCs)

Organism	Formulation/ (Application Method)	Application Rate	Risk Quotients Exceed Level of Concern for			
			Acute High Risk	Acute Restricted Use	Acute Endangered Species	Chronic Risk
Birds [1]	Aerial and ground equipment	1 to 3 apps. at 0.5 ai/A	Y	Y	Y	Y
Mammals [2]			Y	Y	Y	Y
Insects			N/A	N/A	N/A	N/A
Fish [3]			N	N	N	N
Fresh Water Invertebrates			Y	Y	Y	Y
Salt Water Invertebrates [4]			N	N	N	Y
Plants (N/A)			N/A			

[1] **1 app . for acute high risk is 0.23 to 3.8 and 3 apps. for acute risk is .34 to 5.0**
1 app . for chronic risk is 16 to 240 and 3 apps. for chronic risk is 22 to 320

[2] **1 app . for acute high risk is 0.03 to 12.67 and 3 apps. for acute risk is 0 .04 to 16 .89**
1 app . for chronic risk is .55 to 9.0 and 3 apps. for chronic risk is 1.7 to 27

[3] **3 acute apps. less then .01**

[4] **3 acute apps. less then 0 .28**

Table 14. Ecological Incidents

Date	Misuse? (yes/no)	Incident Description	Resulting Label Changes
4/83	Yes	Dicrotophos poisoning caused the deaths of 30 great-tailed grackles (*Quiscalus mexicanus*) and one rock dove (*Columba livia*) in West, Texas. Residues of 16 and 34 ppm of dicrotophos were identified in the GI tracts of two of the birds, confirming that the poisoning was caused by dicrotophos.	Non related to this incident. Dicrotophos is now only used on cotton
3/82	unknown	A report by the U.S. Fish and Wildlife Service attributed to dicrotophos another bird kill that occurred in Texas in (Incident # B0000-400-19). The species involved were the red-winged blackbirds (*Agelaius pheoniceus*), the great-tailed grackle, the brown-headed cowbird (*Molothrus ater*), the eastern meadow lark (*Sturnella magna*), and various sparrows. Birds were found dead and dying in rice fields. Dicrotophos was identified as the causative agent by the Patuxent Wildlife Research Center, Laurel, Maryland.	Dicrotophos is now used on cotton only
1982	Yes	Approximately 1100 birds of 12 species were killed by intentional poisoning in Matagorda County, Texas when someone distributed rice seeds tainted with dicrotophos and monocrotophos. The U.S. Fish and Wildlife Service determined that the rice seeds contained 210 ppm dicrotophos or 950 ppm of monocrotophos. Dead birds that were analyzed had inhibition of brain acetyl cholinesterase activity (82-89%). The GI tracts of birds contained rice seeds and residues of dicrotophos (5.6-11 ppm).	Dicrotophos is now used on cotton only
5/97	Yes	Elgin, TX. AMVAC Chemical Corporation reported that several bulls became ill after dicrotophos (Bidrin) was dumped into their water (# I005361-001). Several of the bulls died despite being administered atropine. Chromatography identified dicrotophos in the drinking water and rumen contents.	
1976	Unknown	The Texas Fish and Wildlife Service report lists an incident that occurred in Washington in 1976 (# B0000-400-20). The incident involved three species of ducks: the American wigeon (*Anas americana*), the common pintail (*Anas acuta*), and the mallard (*Anas platyrhynchos*). The ducks were found dead on two ponds that were near a livestock waste feed disposal site. Dicrotophos was identified as the causative agent by the Patuxent Wildlife Research Center, Laurel, Maryland.	